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FEDERAL - STATE - PRIVATE
COOPERATIVE SNOW SURVEYS



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MAY 20 1970
CURRENT SERIAL RECORDS

WATER SUPPLY OUTLOOK FOR WESTERN UNITED STATES

Including Columbia River Drainage in Canada

and
FEDERAL - STATE - PRIVATE COOPERATIVE SNOW SURVEYS

UNITED STATES DEPARTMENT of AGRICULTURE--SOIL CONSERVATION SERVICE

Collaborating with

CALIFORNIA DEPARTMENT of WATER RESOURCES

and

BRITISH COLUMBIA DEPARTMENT of
LANDS, FORESTS and WATER RESOURCES

AS OF
MAY 1, 1970

TO RECIPIENTS OF WATER SUPPLY OUTLOOK REPORTS:

Most of the usable water in western states originates as mountain snowfall. This snowfall accumulates during the winter and spring, several months before the snow melts and appears as streamflow. Since the runoff from precipitation as snow is delayed, estimates of snowmelt runoff can be made well in advance of its occurrence. Streamflow forecasts published in this report are based principally on measurement of the water equivalent of the mountain snowpack.

Forecasts become more accurate as more of the data affecting runoff are measured. All forecasts assume that climatic factors during the remainder of the snow accumulation and melt season will interact with a resultant average effect on runoff. Early season forecasts are therefore subject to a greater change than those made on later dates.

The snow course measurement is obtained by sampling snow depth and water equivalent at surveyed and marked locations in mountain areas. A total of about ten samples are taken at each location. The average of these are reported as snow depth and water equivalent. These measurements are repeated in the same location near the same dates each year.

Snow surveys are made monthly or semi-monthly from January 1 through June 1 in most states. There are about 1400 snow courses in Western United States and in the Columbia Basin in British Columbia. In the near future, it is anticipated that automatic snow water equivalent sensing devices along with radio telemetry will provide a continuous record of snow water equivalent at key locations.

Detailed data on snow course and soil moisture measurements are presented in state and local reports. Other data on reservoir storage, summaries of precipitation, current streamflow, and soil moisture conditions at valley elevations are also included. The report for Western United States presents a broad picture of water supply outlook conditions, including selected streamflow forecasts, summary of snow accumulation to date, and storage in larger reservoirs.

Snow survey and soil moisture data for the period of record are published by the Soil Conservation Service by states about every five years. Data for the current year is summarized in a West-wide basic data summary and published about October 1 of each year.

PUBLISHED BY SOIL CONSERVATION SERVICE

The Soil Conservation Service publishes reports following the principal snow survey dates from January 1 through June 1 in cooperation with state water administrators, agricultural experiment stations and others. Copies of the reports for Western United States and all state reports may be obtained from Soil Conservation Service, Western Regional Technical Service Center, Room 209, 701 N. W. Glisan, Portland, Oregon 97209.

Copies of state and local reports may also be obtained from state offices of the Soil Conservation Service in the following states:

STATE	ADDRESS
Alaska	P. O. Box "F", Palmer, Alaska 99645
Arizona	6029 Federal Building, Phoenix, Arizona 85025
Colorado (N. Mex.)	12417 Federal Building, Denver, Colorado 80202
Idaho	Room 345, 304 N. 8th. St., Boise, Idaho 83702
Montana	P. O. Box 98, Bozeman, Montana 59715
Nevada	P. O. Box 4850, Reno Nevada 89505
Oregon	1218 S. W. Washington St., Portland, Oregon 97205
Utah	4012 Federal Building, Salt Lake City, Utah 84111
Washington	360 U.S. Court House, Spokane, Washington 99201
Wyoming	P. O. Box 340, Casper, Wyoming 82601

PUBLISHED BY OTHER AGENCIES.

Water Supply Outlook reports prepared by other agencies include a report for California by the Water Supply Forecast and Snow Surveys Unit, California Department of Water Resources, P. O. Box 388, Sacramento, California 95802 --- and for British Columbia by the Department of Lands, Forests and Water Resources, Water Resources Service, Parliament Building, Victoria, British Columbia



WATER SUPPLY OUTLOOK FOR WESTERN UNITED STATES

Including Columbia River Drainage in Canada

ISSUED

MAY 1, 1970

The Soil Conservation Service coordinates snow surveys conducted by its staff and many cooperators, including the Bureau of Reclamation, Corps of Engineers, Forest Service, National Park Service, Weather Bureau, Geological Survey, and other Federal Agencies, Departments of State Government, Irrigation Districts, Power Companies, and others.

The Department of Water Resources coordinates snow surveys in California.

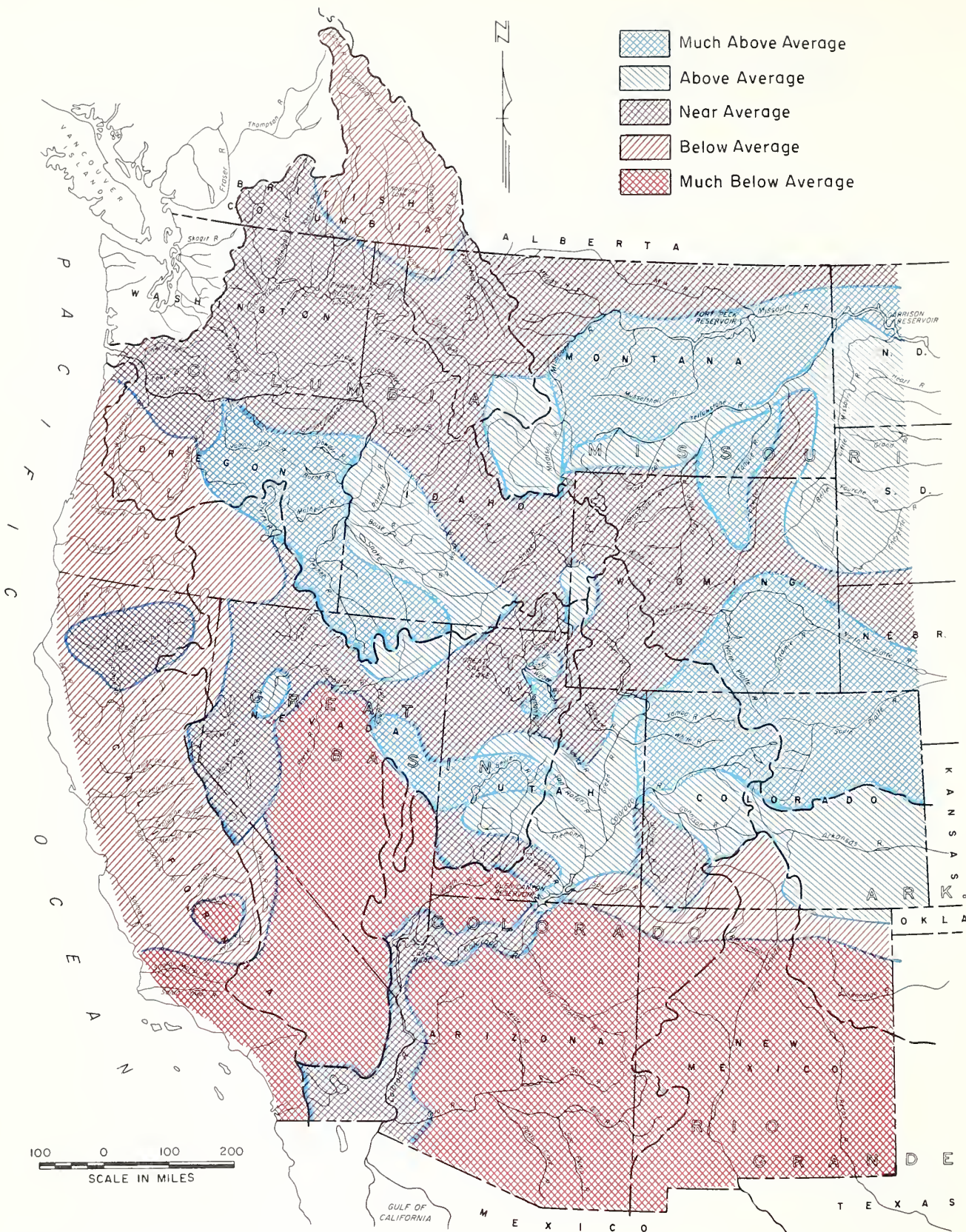
The Water Resources Service, Department of Lands, Forests, and Water Resources directs snow surveys in British Columbia.

This report was prepared by the Water Supply Forecasting Branch, Engineering Division, Soil Conservation Service, from data supplied by Snow Survey Supervisors of the Soil Conservation Service in the States of Alaska, Arizona, Colorado and New Mexico, Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming.

Data from California was supplied by the Chief, Water Supply Forecast and Snow Survey Unit, Department of Water Resources.

Data from British Columbia was supplied by the Chief, Hydrology Division, Water Investigations Branch, Department of Lands, Forests and Water Resources.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
KENNETH E. GRANT, ADMINISTRATOR



1970 SNOWMELT SEASON
PROSPECTIVE STREAMFLOW
 AS OF MAY 1, 1970

WATER SUPPLY OUTLOOK

1970 SNOWMELT SEASON

MAY 1, 1970

GENERALLY EXCELLENT RESERVOIR STORAGE PROMISES SATISFACTORY WATER FOR THOSE MAJOR IRRIGATED AREAS WHERE CURRENT STREAMFLOW PROSPECTS ARE BELOW NORMAL. THIS APPLIES PARTICULARLY TO WESTERN OREGON, CALIFORNIA, ARIZONA AND NEW MEXICO. NEAR OR CONSIDERABLY ABOVE AVERAGE STREAMFLOW, COMBINED WITH EXCELLENT RESERVOIR STORAGE, ASSURES EXCEPTIONALLY GOOD WATER FOR MOST REMAINING WESTERN AREAS. SOME HIGH WATER PROBLEMS MAY BE EXPERIENCED IN CENTRAL AND SOUTHERN MONTANA, ALONG COLORADO AND WYOMING'S PLATTE RIVER SYSTEM, IN SOUTHERN IDAHO AND EASTERN OREGON.

Cool temperatures during April greatly delayed snowmelt throughout the West, generally causing snowpacks to continue their buildup during the month. April flow of many western streams was near 50 to 70 percent of average. This delayed snowmelt was beneficial for those areas where prospective streamflow was below average, in that streamflow should now hold up longer into the late summer months. However, in those areas where streamflow prospects were already for well above average flows, the delayed melt has intensified the prospect for possible damage from high water. More water will now flow down the streams in a shorter period of time.

Mountain snowfall during April was very light in California, southern Nevada, across Arizona and New Mexico and on British Columbia tributaries to the upper Columbia and Kootenay rivers. On most other western watersheds the month's snowfall was near average or considerably above.

The California Department of Water Resources reports that this year's spring and summer runoff from Sierra and Cascade watersheds will generally be below normal. However, reservoir storage is above normal in all areas of the state and ground water levels are generally good. Combining stored water with anticipated snowmelt runoff indicates that water supplies will be sufficient to meet normal summer demands, except in those localized areas where development of conservation storage and ground water basins has not kept pace with growth.

The upper Columbia and Kootenay rivers in British Columbia have snowpacks near 75 to 80 percent of normal, according to the British Columbia Department of Lands, Forests and Water Resources. Within the province the snow

cover increases from the above values to about 5 percent above average on the Okanogan-Similkameen drainages. If it had not been for the very cool temperatures of April which prevented a normal snowmelt, the above snowpack percentages would be considerably lower. April snowfall was very light, contributing little to prospective runoff volumes. No irrigation shortages are anticipated in British Columbia.

While below average runoff is anticipated for most western Oregon and Washington streams, flows should be within about 10 to 15 percent of average. When combined with present reservoir storage there should be adequate water supplies in these states.

Near normal runoff is expected in northern Idaho from the Salmon River northward, in northern and northwestern Montana on the Milk, Marias, Sun, Teton, Flathead and lower Clark Fork rivers. Near average flows are also anticipated on Wyoming's Wind, Bighorn, Shoshone, Snake and Green rivers. Most of northern Utah and northern Nevada will also realize near average streamflow this summer, but have smaller areas where streams will yield above to much above average flows.

Areas where much above normal streamflow (130 to over 200 percent) is anticipated include central and south central Montana, the Little Bighorn and Tongue rivers along the Montana-Wyoming border, the North and South Platte rivers of Wyoming and Colorado, the White, Yampa, upper Colorado and Little Snake rivers of the upper Colorado river basin, streams of eastern Oregon and southwestern tributaries to the Snake river in Idaho.

SUMMARY OF SNOW WATER EQUIVALENT MEASUREMENTS

MAY 1, 1970

MAJOR BASIN AND SUB - WATERSHED	WATER EQUIVALENT IN PERCENT OF:		MAJOR BASIN AND SUB - WATERSHED	WATER EQUIVALENT IN PERCENT OF:	
	LAST YEAR	AVERAGE		LAST YEAR	AVERAGE
MISSOURI BASIN			SNAKE BASIN		
Jefferson	136	133	SNAKE above Jackson, Wyo.	148	130
Madison	160	168	SNAKE above Hiese, Idaho	159	135
Gallatin	195	162	SNAKE abv.American Falls Res.	162	138
Missouri Main Stem	221	147	Henry's Fork	158	141
Yellowstone	207	150	Southern Idaho Tributaries	162	158
Shoshone	---	161	Big and Little Wood	93	123
Wind	163	129	Boise	116	129
North Platte	172	157	Owyhee	314	314
South Platte	245	164	Payette	129	141
			Malheur	372	211
ARKANSAS BASIN			Weiser	250	123
Arkansas	237	166	Burnt	234	210
Canadian	---	---	Powder	191	166
			Salmon	132	126
RIO GRANDE BASIN			Grande Ronde	133	139
Rio Grande (Colo.)	103	101	Clearwater	124	110
Rio Grande abv.Otowi Bridge	---	---			
Pecos	---	---	LOWER COLUMBIA BASIN		
			Yakima	116	140
COLORADO BASIN			Umatilla	278	195
Green (Wyo.)	156	121	John Day	296	202
Yampa - White	230	165	Deschutes - Crooked	88	91
Duchesne	78	113	Hood	97	99
Price	112	152	Willamette	63	74
Upper Colorado	233	170	Lewis	62	73
Gunnison	150	142	Cowlitz	101	128
San Juan	83	91			
Dolores	127	148	PACIFIC COASTAL BASIN		
Virgin	34	98	Puget Sound	90	96
Gila	---	---	Olympic Peninsula	62	73
Salt	---	---	Umpqua - Rogue	52	74
			Klamath	46	67
GREAT BASIN			Trinity	40	85
Bear	130	137			
Logan	143	132	CALIFORNIA		
Ogden	93	129	CENTRAL VALLEY		
Weber	104	137	Upper Sacramento	50	100
Provo - Utah Lake	95	140	Feather	35	75
Jordan	118	150	Yuba	35	75
Sevier	68	128	American	35	80
Walker - Carson	45	101	Mokelumne	35	80
Tahoe - Truckee	44	89	Stanislaus	35	80
Humboldt	190	---	Tuolumne	35	85
Lake Co. (Oregon)	66	120	Merced	30	85
Harney Basin (Oregon)	500	223	San Joaquin	30	80
			Kings	25	75
UPPER COLUMBIA BASIN			Kaweah	20	65
Columbia (Canada)	87	78	Tule	20	30
Kootenai (Canada)	99	79	Kern	15	45
Clark Fork	150	126			
Bitterroot	140	115	Data for California Watersheds supplied by Dept. of Water Resources, and for British Columbia Watersheds by Dept. of Lands, Forests and Water Resources.		
Flathead	151	110			
Spokane	103	108	Average is for 1953-67 period. California aver- ages for the period 1931-65.		
Okanogan	136	118			
Methow	111	125	Based on Selected Snow Courses determined by Dis- tribution within the Basin, Length of Record and Repetitive Monthly Measurement Schedules.		
Chelan	74	83			
Wenatchee	93	104			

Percentagewise the heaviest runoff is expected from the Smith, Belt, Judith and Musselshell rivers of central Montana. These streams will yield essentially twice their normal amounts. On these watersheds snowpack is a maximum of record. Low elevation snowpacks here and on the lower Yellowstone River are exceptionally heavy and could create additional problems if rainfall occurs during the main snowmelt period.

In Arizona total runoff for the January-May period will be about 50 percent average on the Salt and Gila rivers. Reservoir storage is above average and will offset the effect of the low streamflow.

Storage in Elephant Butte reservoir on the Rio Grande River in New Mexico is about half again more than average for this time of year and will go far toward offsetting low streamflow prospects.

MISSOURI BASIN

Snowpack on the upper Missouri River and its tributaries in Montana shows considerable variability. It is lightest on the Milk, Marias, Sun and Teton rivers where near average streamflow is indicated. The snowpack is a maximum of record on snow courses in central and south central sections of the state. In this latter area low elevation snowpack is heavy and could present some problems if rainfall occurs during the main snowmelt period.

Snowfall during April was heavy on the Missouri and also on the Yellowstone River, except on the extreme headwater area in Yellowstone Park. On the Yellowstone River the low elevation snowpack is also heavy, increasing the potential for high water. Snowpack on the upper Missouri and Yellowstone rivers ranges from about 135 to 170 percent average. This also applies to the north end of the Big Horn Mountains on the Tongue and Little Bighorn rivers.

In Wyoming the snow cover decreases to about one-fourth to one-third above average on the Wind and main Bighorn rivers. It increases again in southern Wyoming and northern Colorado on the North and South Platte River systems, where many snow courses recorded record or near record snow water contents. The snow on North and South Platte is near 155 to 165 percent average.

Heaviest streamflow in Montana is expected from the Smith, Belt, Judith and Musselshell rivers where flows will be essentially twice their usual amounts. Flow of the main stem of the Missouri will be near 135 to 140 percent at Landusky, Montana and Williston, North Dakota. The Tongue and Little Bighorn rivers should produce more than 50 percent above normal amounts. Flow of the Yellowstone River will vary from essentially average at Yellow-

stone Lake to a third more than average at Miles City. In Wyoming, flow of the Wind, Shoshone and Bighorn rivers will be near or a little above average. Smaller streams heading in the Black Hills of northeastern Wyoming, northwestern South Dakota should yield about 15 to 25 percent above their usual amounts.

Streamflow forecasts for the Platte River system range from 140 percent for the Cache LaPoudre near Fort Collins, Colorado to 169 percent for the North Platte at Saratoga, Wyoming. High water problems could develop on these streams, particularly if a period of above normal temperatures should persist for any length of time. Above normal rainfall could intensify the problems.

ARKANSAS BASIN

Cool April weather has greatly retarded snowmelt, leaving more water to come during the regular irrigation season. The snowpack on the Arkansas River is now two-thirds more than usual for this time of year. Because of the delayed snowmelt, however, mountain soils are drier than normal for May 1st.

The Arkansas River is now forecast to yield 129 percent average at Salida, and 125 percent at Pueblo. Higher flows are expected from the smaller southern tributaries as indicated by the forecast of 152 percent average for the Purgatoire at Trinidad. Carryover storage is good. Valley soil moisture is also good for this time of year.

The Canadian drainage is not highly affected by snow, but very little snowmelt runoff will be realized. However, storage is good in Conchas reservoir, which holds 155 percent of its average amount.

RIO GRANDE BASIN

April weather failed to materially improve the water supply prospects in the Rio Grande basin. While there was a slight improvement on the headwater areas in Colorado, it was not enough to have any major effect on the forecasts in New Mexico. Water supplies will be short throughout much of the basin, with late season flows especially low. Forecasts are generally near or below 70 percent of average. Outlook for the Pecos River is similar.

Storage in Elephant Butte reservoir is excellent. The reservoir holds 149 percent of its usual amount for this time of year. Water shortages this year will principally be felt by those above reservoirs or by water users who have limited storage rights.

Valley soil moisture conditions are reported as fair to poor. If crops have to be irrigated up, much valuable water will be required early, leaving less for the late season.

SELECTED STREAMFLOW FORECASTS (Thousand Acre Feet)

MAY - SEPTEMBER 1970 as of MAY 1, 1970

STREAM and STATION	Forecast This Year		Last Year's Flow
	Flow	Percent of Average	
UPPER MISSOURI			
Jefferson at Sappington, Montana	1020	125	1002
Madison near Grayling, Montana <u>1/</u>	417	111	496
Gallatin near Gateway, Montana	618	140	522
Smith River near Eden, Montana	318	200	
Sun at Gibson Dam, Montana <u>3/</u>	615	107	440
Belt near Monarch, Montana	200	197	
Marias near Shelby, Montana <u>4/</u>	550	103	340
Missouri near Landusky, Montana <u>2/</u>	5500	141	
S. F. Musselshell above Martinsdale, Montana	86.5	207	
Milk near Eastern Crossing, Montana	210	96	
Yellowstone at Yellowstone Lake Outlet, Wyo.(Apr.Oct.)	836	100	
Yellowstone at Corwin Springs, Montana	2280	126	1950
Clark Fork at Chance, Montana	700	125	
Shoshone, Inflow to Buffalo Bill Res., Wyo.*	892	110	
Wind at Dubois, Wyoming *	105	106	
Wind at Riverton, Wyo. *	670	103	
Bull Lake near Lenore, Wyoming *	178	100	
Tensleep near Tensleep, Wyoming *	74	100	
Tongue near Dayton, Wyoming *	162	157	
Yellowstone at Miles City, Montana <u>5/</u>	7200	132	
Missouri near Williston, N. Dakota <u>6/</u>	13000	136	
PLATTE			
North Platte at Saratoga, Wyoming *	940	169	
Laramie near Jelm, Wyoming <u>7/</u> *	154	148	
Clear at Golden, Colorado *	200	168	
St. Vrain at Lyons, Colorado *	115	164	
Cache LaPoudre near Fort Collins, Colorado <u>8/</u> *	300	140	
ARKANSAS			
Arkansas at Salida, Colorado <u>9/</u> *	400	129	
Purgatoire at Trinidad, Colorado *	70	152	
RIO GRANDE			
Rio Grande near Del Norte, Colorado <u>10/</u> *	370	85	
Conejos near Mogote, Colorado <u>11/</u> *	125	69	
El Vado Res., Inflow, New Mex. (March-July)	135	72	
Rio Grande at Otowi Bridge, New Mexico <u>12/</u> (March-July)	370	72	
Pecos at Pecos, New Mexico (March-July)	25	61	
UPPER COLORADO			
Granby Reservoir Inflow, Colorado <u>13/</u> *	300	137	
Colorado at Dotsero, Colorado <u>14/</u> *	1950	142	
Roaring Fork at Glenwood Springs, Colorado <u>15/</u> *	950	137	
Gunnison at Grand Junction, Colorado <u>16/</u> *	1675	147	
Dolores at Dolores, Colorado *	210	91	
Colorado near Cisco, Utah <u>16/</u> **	4090	146	3653
Green at Warren Bridge, Wyoming *	326	101	
Flaming Gorge Res., Utah, Net Inflow <u>17/</u> **	1125	107	1061
Yampa at Steamboat Springs, Colorado *	370	142	
Yampa near Maybell, Colorado *	1200	141	
Little Snake nr. Dixon, Wyoming *	420	162	
White near Meeker, Colorado *	380	130	
Duchesne near Tabiona, Utah <u>18/</u> ***	86	101	
Whiterocks near Whiterocks, Utah ***	40	83	69
Scofield Reservoir, Utah, Net Inflow <u>19/</u> ***	30	111	
Green at Green River, Utah <u>17/</u> **	3265	127	1796
Navajo Reservoir Inflow, New Mexico **	420	68	591
Animas at Durango, Colorado *	375	92	
San Juan near Bluff, Utah <u>20/</u> **	650	73	923
Colorado, Inflow to Lake Powell, Arizona <u>21/</u> **	8240	126	7247

SELECTED STREAMFLOW FORECASTS (Thousand Acre Feet) MAY - SEPTEMBER 1970 as of MAY 1, 1970

STREAM and STATION	Forecast This Year		Last Year's Flow
	Flow	Percent of Average	
LOWER COLORADO			
Gila near Solomon, Arizona (April-May)	17.5	51	21.5
Salt at Intake, Arizona (April-May)	76	62	206
Verde above Horseshoe Dam, Arizona (April-May)	28	56	64
GREAT BASIN			
Bear at Harer, Idaho ***	170	109	174
Logan near Logan, Utah <u>22/</u> ***	90	105	91
Ogden, Inflow to Pine View Res., Utah <u>23/</u> ***	75	119	80
Weber near Oakley, Utah ***	103	104	131
Utah Lake, Utah, Net Inflow ***	145	107	197
Big Cottonwood near Salt Lake City Utah ***	43	143	39
Beaver near Beaver, Utah ***	20	121	32
Sevier near Hatch, Utah ***	24	89	92
Sevier near Gunnison, Utah **	33	151	83
Humboldt at Palisades, Nevada ***	145	119	
Truckee at Farad, California <u>26/</u> ***	170	90	
East Carson near Gardnerville, Nevada ***	135	94	
West Walker near Coleville, California ***	125	100	
Donner und Blitzen near Frenchglen, Oregon	46	102	53
Silvies near Burns, Oregon	62	151	25
Chewaucan near Paisley, Oregon	51	82	
Deep above Adel, Oregon	37	85	
UPPER COLUMBIA			
Columbia at Revelstoke, British Columbia	14800	84	17160
Kootenai at Libby, Montana	5500	74	8087
Kootenai at Leonia, Idaho	6200	74	9169
Blackfoot near Bonner, Montana	970	108	847
Flathead near Columbia Falls, Montana <u>27/</u>	5940	101	4103
Flathead near Polson, Montana <u>27/</u>	6840	99	4567
Clark Fork above Missoula, Montana	1765	114	1549
Bitterroot near Darby, Montana	506	101	462
Clark Fork at Plains, Montana <u>27/</u>	11240	101	8807
Columbia at Birchbank, British Columbia <u>27/</u>	36500	84	43150
Spokane at Post Falls, Idaho <u>28/</u>	2100	100	
Columbia at Grand Coulee, Washington <u>27/</u>	54000	86	
Okanogan near Tonasket, Washington	1400	87	
Chelan at Chelan, Washington <u>29/</u>	990	86	
Wenatchee at Peshastin, Washington	1480	92	
SNAKE			
Snake above Palisades, Res., Wyoming <u>30/</u> *	2740	107	
Grey's above Palisade, Wyoming *	420	116	
Salt above Palisade, Wyoming *	400	125	
Snake near Heise, Idaho <u>30/</u>	3600	106	
Henry's Fork near Rexburg, Idaho <u>31/</u>	1160	105	
Teton near St. Anthony, Idaho	3900	110	
Big Lost near Mackay, Idaho <u>32/</u>	155	97	
Big Wood, Inflow to Magic Res., Idaho <u>33/</u>	230	125	
Salmon Falls Creek nr San Jacinto, Idaho	80	173	
Bruneau near Hot Springs, Idaho	240	169	
Owyhee Res., Net Inflow, Oregon	260	145	214
Boise near Boise, Idaho <u>34/</u>	1600	130	
Malheur near Drewsey, Oregon	57	168	23
Payette near Horseshoe Bend, Idaho <u>35/</u>	1900	126	
Snake at Weiser, Idaho	5900	118	
Imnaha at Imnaha, Idaho	239	106	
Salmon at Whitebird, Idaho	6700	108	
Grande Ronde at LaGrande, Oregon	104	99	119
Clearwater at Spalding, Idaho	7600	111	

SELECTED STREAMFLOW FORECASTS (Thousand Acre Feet) MAY - SEPTEMBER 1970 as of MAY 1, 1970

STREAM and STATION	Forecast This Year		Last Year's Flow
	Flow	Percent of Average	
LOWER COLUMBIA			
Yakima at CleElum, Washington <u>36/</u>	650	82	
Umatilla at Pendleton, Oregon	71	89	89
John Day, Middle Fork at Ritter, Oregon	105	142	77
Crooked near Post, Oregon	55	138	
Deschutes at Benham Falls, Oregon <u>37/</u>	410	80	449
Columbia at The Dalles, Oregon <u>27/</u>	82350	89	87847
Hood near Hood River, Oregon <u>37/</u>	210	86	
Willamette at Salem, Oregon <u>37/</u>	2760	84	
Lewis at Ariel, Washington <u>38/</u>	870	91	
Cowlitz at Castle Rock, Washington	1860	88	
NORTH PACIFIC COASTAL			
Dungeness near Sequim, Washington	125	82	
Umpqua, No., near Toketee Falls, Oregon	130	88	
Rogue at Raygold, Oregon	580	84	731
Klamath Lake, Net Inflow, Oregon	312	81	352
CALIFORNIA CENTRAL VALLEY <u>39/</u> **			
Sacramento, Inflow to Shasta, California	1750	100	2588
Feather near Oroville, California	1350	73	3307
Yuba at Smartville, California	790	72	1748
American, Inflow to Folsom Res., Calif.	980	74	2191
Cosumnes at Michigan Bar, California	80	62	230
Mokelumne, Inflow to Pardee Res., Calif.	390	84	882
Stanislaus, Inflow to Melones Res., Calif.	590	83	1392
Tuolumne, Inflow to Don Pedro Res., Calif.	1030	87	2405
Merced, Inflow to Excheque Res., Calif.	480	80	1379
San Joaquin, Inflow to Millerton Lake, Calif.	990	84	2898
Kings, Inflow to Pine Flat Res., California	950	83	3163
Kaweah, Inflow to Terminus Res., California	150	57	807
Tule, Inflow to Success Res., California	32	57	222
Kern, Inflow to Isabella Res., California	350	86	1649

Forecasts in California provided by Department of Water Resources.
Average is for 1953-67 period except California, California is computed for 1916-65.
Forecasts assume average Effective Climatic Conditions from Date Through Snow Melt Season.

Explanatory Notes on Forecasts Listed on Inside Back Cover.
* April - September Period ** April - July Period *** May - July Period

COLORADO BASIN

Cool temperatures during April greatly delayed snowmelt, causing snowpacks to continue their buildup during the month. While the snowpack for the entire upper Colorado River basin above Lake Powell is near 130 percent of average, it ranges from near 90 percent on the San Juan River to near 170 percent on the upper Colorado, Yampa and White rivers.

Prospective April-July inflow to Lake Powell has increased and is now forecast at 126 percent of average. Last month the expected inflow was 110 percent.

The present water outlook assures most water users in the upper basin of good to excellent water supplies during the coming summer months. Minor late season shortages may

develop along the San Juan River and in southern Utah along the Virgin and Paria rivers, unless wet weather is experienced during the summer months. Any shortages that develop will principally affect those water users who are on natural flow rights, or where reservoir storage is limited.

Storage in most irrigation reservoirs remains considerably above average.

Highest streamflow (percentagewise) expected in the upper basin is for the Little Snake near Dixon, Wyoming, forecast at 162 percent. Forecasts for the Gunnison, upper Colorado, Yampa and White rivers in Colorado range from near 120 to 140 percent. Inflow to Flaming Gorge on the Green River is expected to be slightly above average. Inflow to the river system is expected to be within 10 percent of

average from the Duchesne, Dolores and Animas rivers.

In Arizona the water supply outlook is good for the major irrigated areas. Reservoir storage is well above average in all major reservoirs and will offset the effect of low streamflow. The total spring runoff for the January-May period will be about 50 percent average on the Salt and Gila rivers and 65 percent on the Verde River. Shortages will be experienced in smaller areas not having reservoir supplies to depend on. Considerable pumping of ground water will be required on the upper Gila River and on the San Carlos Project.

The snowpack in southern Nevada continues very deficient. It will not provide sufficient streamflow to meet demands this summer, particularly during late season.

GREAT BASIN

As elsewhere in the west, very cool temperatures during April resulted in an abnormal snowpack buildup and below average streamflow. April flow of many streams was near 50 to 70 percent of average. This delayed snowmelt was generally beneficial in that streamflow should now hold up longer into the late summer months.

Considering the well above average reservoir storage supplies throughout the Great Basin, and generally favorable streamflow prospects for all but some smaller areas in central and southern Nevada, the outlook for the summer's water supply is very good for all major irrigated areas.

The snowpack in the Basin generally ranges from 120 to 150 percent of average. It is lighter than this (about average to 10 percent less than average) in the Tahoe-Truckee river basin, and on the Carson and Walker rivers. It is over twice normal in the Harney Basin of Oregon. Because of the delayed snowmelt the mountain soils under the major snowpack areas are drier than usual for May 1st.

Streamflow forecasts in Nevada range from 81 percent on the Little Truckee River to near 130 percent in White Pine County. Flow of the Walker, Carson and Truckee rivers will be about average to 10 percent less than average. The Humboldt River and its major tributaries will flow about 15 to 20 percent more than normal. Reservoir storage in Nevada is 131 percent of average.

Flow of the Bear River and its tributary streams in Utah, Idaho and Wyoming will generally be near average, with highest forecast on Smiths Fork in Wyoming at 120 percent. Outlook for the upper Sevier River in southern Utah has improved and should now provide near

normal supplies. The outlook has also improved for smaller tributary streams in northern Utah's Cache Valley. Considerably above normal runoff is expected from the middle and lower Sevier rivers, as well as from smaller streams near Salt Lake. Flow of other streams will be near average. Reservoir storage in Utah is 135 percent of average.

COLUMBIA BASIN

There has been a general improvement in the water supply outlook for this summer, particularly for irrigation purposes. Snowfall during April was near or above average in most of the basin, a principal exception being on Canada's watersheds. Very cool weather during the month prevented a normal snowmelt and runoff, leaving more runoff to come in a shorter time period. As a consequence streamflow forecast percentages for the remaining snowmelt period have increased significantly.

Considering current streamflow prospects and reservoir storage, all areas of the Columbia Basin should experience adequate water supplies this summer. Flow of the Kootenay in British Columbia will be near three-fourths average. Heavy runoff (130 to 175 percent) is expected in central and eastern Oregon and southwestern Idaho. From 10 to 25 percent above average flows are anticipated from northern tributaries to the Snake River from the vicinity of Weiser to near the Twin Falls area, from the Salt and Grey's rivers in Wyoming and the upper Clark Fork in Montana.

Flow of most remaining streams will be within about 15 percent of average.

Soil moisture is still near or below average at high elevations due to the lack of snowmelt during April.

The present snow cover is lowest percentage-wise on the upper Columbia, the Kootenai, Willamette and Lewis rivers. It is at near three-fourths of the normal amount. The snowpack ranges from about 165 to over 200 percent of average in central and eastern Oregon on watersheds of the John Day, Umatilla, Burnt, Powder and Malheur rivers. It is over 300 percent on the Owyhee River. The snow ranges from about 140 to 230 percent along the southern and upper Snake River tributaries in Idaho. It is 20 to 40 percent above average in Wyoming, central Idaho, on the upper Clark Fork in Montana and on Washington's Methow, Wenatchee, Yakima and Cowlitz rivers. It is within about 20 percent of average on remaining watersheds.

Storage in irrigation reservoirs continues near or above average except in Washington. In areas where heavy runoff is expected, some irrigation reservoirs are being drawn down.

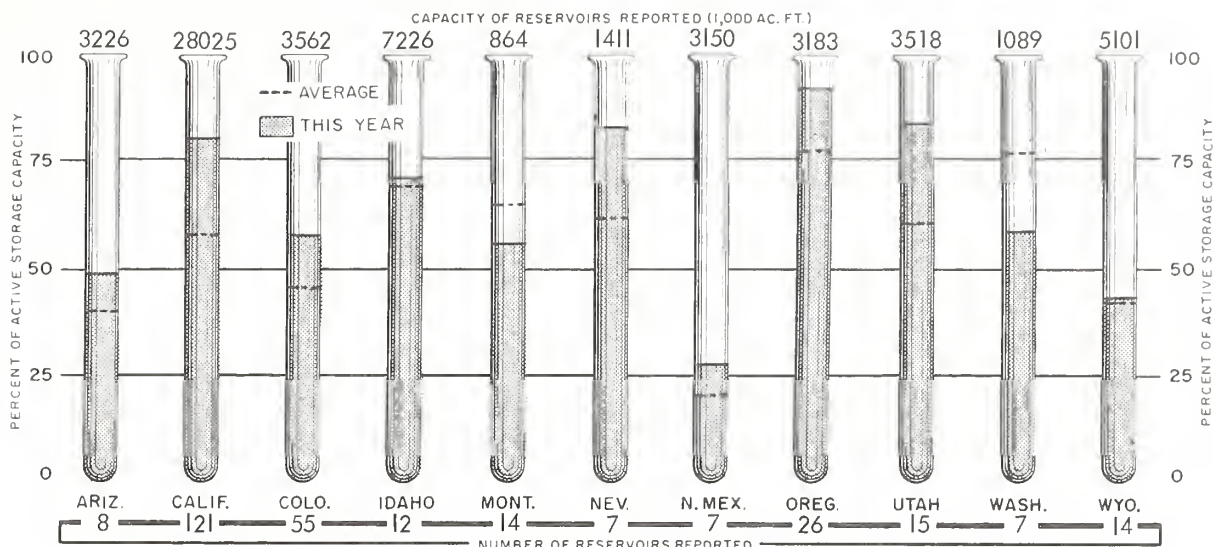
STORAGE IN LARGE RESERVOIRS

MAY 1, 1970

BASIN AND NAME OF RESERVOIR	CAPACITY (1000 A.F.)	STORAGE (1000 A.F.)	BASIN AND NAME OF RESERVOIR	CAPACITY (1000 A.F.)	STORAGE (1000 A.F.)
UPPER MISSOURI			UPPER COLUMBIA		
Belle Fourche	185	139	Chelan	676	74
Boysen	550	173	Coeur d'Alene	225	149
Buffalo Bill	373	100	Duncan	1347	86
Canyon Ferry	2043	1401	Flathead	1219	180
Fort Peck	19140	16300	Hungry Horse	2982	1306
Garrison	24500	18475	Kootenay	673	0
Hebgen	377	266	Lower Arrow	3083	0
Keyhole	192	122	Noxon Rapids	335	59
Lake Francis Case	5816	4444	Pend Oreille	1155	434
Lake Sharpe	1900	1735	Roosevelt	5232	538
Oahe	23630	19725	Upper Arrow	4061	0
Tiber	1347	531			
Yellowtail	1356	851	LOWER COLUMBIA		
PLATTE			Cougar	165	127
City of Denver (5)	507	467	Detroit	340	300
Colo-Big Thompson (3)	718	455	Hills Creek	249	207
Glendo	784	486	Lookout Point	349	279
Pathfinder	1016	321	Yakima Res. (5)	1066	640
Seminole	1010	274	SNAKE		
ARKANSAS			American Falls	1700	1713
Conchas	273	233	Anderson Ranch	423	263
John Martin	354	57	Arrowrock	287	280
RIO GRANDE			Brownlee	980	405
Elephant Butte	2195	479	Cascade	653	307
El Vado	195	8	Jackson	847	621
UPPER COLORADO			Lucky Peak	278	93
Blue Mesa	830	421	Owyhee	715	696
Flaming Gorge	3749	1476	Palisades	1200	869
Navajo	1696	877	PACIFIC COASTAL		
Powell	25002	9152	Clair Engle	2448	2340
LOWER COLORADO			Clear Lake	440	367
Havasu	619	591	Nacimiento	350	141
Mead	26159	16568	Ross	1052	158
Mohave	1810	1612	Upper Klamath	465	434
Salt River Res. (4)	1755	1229	CALIFORNIA CENTRAL VALLEY		
San Carlos	985	142	Almanor	1036	937
Verde River Res. (2)	318	150	Berryessa	1602	1586
GREAT BASIN			Folsom	1010	703
Bear	1421	1151	Isabella	570	263
Lahontan	286	228	McClure	1026	700
Rye Patch	179	173	Millerton	521	443
Sevier Bridge	236	223	Oroville	3484	3001
Strawberry	274	201	Pine Flat	1013	814
Tahoe	732	622	Shasta	4500	4100
Utah	884	863			
Willard Bay	193	161			

Reservoir Storage Data Provided by Bureau of Reclamation, Corps of Engineers, Geological Survey, and water using organizations. Data from California and British Columbia provided by Department of Water Resources and Department of Lands, Forests and Water Resources, respectively.

RESERVOIR STORAGE as of MAY 1, 1970



ALASKA

April snowfall was light throughout the interior of the state. Recorded snow depths and water equivalents are generally lowest since measurement began. Weather was cool during the past month but much of the snow at the lower elevations melted, producing very little runoff.

High elevation snow cover in the Chugach Mountains and in parts of the Alaska Range is heavy. Some snow courses in the Chugach Mountains have the maximum snow pack of record. Summer streamflow in this area is expected to be greater than normal.

Soils are generally dry except on the Kenai peninsula, Chugach - Coast Range area. Streamflow in interior Alaska is expected to be light. The Chena and Salcha rivers near Fairbanks have been forecast to flow only 30 percent of normal for the snowmelt period.

Many farmers in the Matanuska and Tanana Valleys are developing sprinkler irrigation systems to offset the very dry soil condition and to supplement normal rainfall.

CALIFORNIA

The California Department of Water Resources, coordinating agency for snow surveys and water supply forecasting in California, reports that May 1 forecasts show that spring and summer runoff from Cascade and Sierra snowmelt watersheds will average about 80 percent of normal. Only the Upper Sacramento River watersheds and

several streams in the Central Lahontan area are expected to produce near normal summer flows. As in all but exceptionally good years, shortages can be anticipated in those localized areas where development of conservation storage and ground water basins have not kept pace with growth. Generally, water supplies in most areas will be sufficient to meet normal demands due to the excellent reservoir carryover storage. Ground water storage is relatively good, due primarily to recharge from the exceptionally wet conditions of last year.

This year, the legendary April showers produced only 35 percent of normal precipitation throughout the State with little or no precipitation occurring in the Central Coastal area and south of the Tehachapi Mountains. April storms were of the cold type, dropping temperatures from 4 to 8 degrees below normal in most areas and about 10 degrees below normal in the mountains and interior basins. Below freezing temperatures caused extensive damage to California's specialty crops in the Central Valley and coastal areas. Thus, after three consecutive months of below normal precipitation the season of precipitation and snow accumulation in California is essentially over. While it is still possible for rather heavy general storms to materialize, such occurrence is improbable. Seasonal precipitation to date for California is 105 percent of normal with a distribution from normal to well above in the northern half of the State and about 70 percent of normal in the south.

May 1 snow surveys of key courses and reports from snow sensors indicate that the water content in the State's snowpack is 80 percent of average for this date. These

measurements confirm that the cold regime during April has held high elevation melting to a minimum. Although April storms did result in snow being deposited below the 5,000-foot elevation, this was quite shallow and of low density, resulting in a rapid dissipation. As a result of the warm rains of January and spring-like weather of March, snow courses at the 6,000- and 7,000-foot elevation that normally on May 1 would have 10 or more inches of snow stored water were, in many instances, bare of snow.

May 1 forecasts of the April-July runoff from snowmelt streams of the Central Valley will be 80 percent of average, assuming normal precipitation during the remainder of the season. The Sacramento and San Joaquin Valleys are both 80 percent of normal. Only watersheds in the Upper Sacramento River Basin and several streams in the Lahontan area are forecasted to have normal or above April-July flows this year. Total water year runoff for the State's

streams is now forecasted at 130 percent of average with below normal amounts occurring only in the Central and South Coastal areas, which are both 80 percent of average.

Streamflow during April was much below normal in all areas of California, averaging about 50 percent of normal for the month. Streams fed by snowmelt were the greatest producers, but were below that expected, reflecting the cold weather conditions of April. Seasonal streamflow for the first seven months of the water year to date range from 170 percent of average in the Sacramento Valley to 75 percent of average in the South Coastal area.

On May 1, the aggregate storage in 121 major reservoirs in California, with a combined capacity of 28,025,000 acre-feet, was 22,566,000 acre-feet. This amounts to 115 percent of normal for May 1.



EXPLANATION of STREAMFLOW FORECASTS

All flows are observed flows except as adjusted for: 1/ Change in storage in Hebgen Lake. 2/ Change in storage in Canyon Ferry and Tiber reservoirs. 3/ Change in storage in Gibson Reservoir and measured diversions. 4/ Change in storage in Two Medicine, Four Horns and Lake Francis reservoirs. 5/ Change in storage in Boysen and Buffalo Bill reservoirs.

6/ Change in storage in Boysen, Buffalo Bill, Canyon Ferry, Tiber, and Fort Peck reservoirs. 7/ Plus diversions to Cache la Poudre. 8/ Minus diversions from North Platte, Laramie, and Colorado rivers plus measured diversions above station. 9/ Change in storage in Twin Lakes and Sugar Loaf reservoirs minus diversions from Colorado River. 10/ Change in storage in Rio Grande, Santa Maria, and Continental reservoirs.

11/ Change in storage in Platoro Reservoir. 12/ Change in storage in El Vado Reservoir. 13/ Change in storage in Granby Reservoir plus diversions to Cache la Poudre and through Adams Tunnel. 14/ Changes as indicated in (13) plus Moffat Tunnel diversion. 15/ Plus diversions to Arkansas River.

16/ Change in storage in Blue Mesa reservoir. 17/ Change in storage in Flaming Gorge, Fontenelle and Big Sandy reservoirs. 18/ Plus diversion through Duchesne Tunnel. 19/ Change in storage in Scofield Reservoir. 20/ Change in storage in Navaho Reservoir.

2 21/ (Lee's Ferry) Change in storage in Flaming Gorge, Navajo, Lake Powell and Big Sandy reservoirs. 22/ Plus Utah Power and Light Company tailrace and Logan, Hyde Park, and Smithfield canals. 23/ (Inflow record computed by U. S. Bureau of Reclamation.) 24/ Plus diversion by Weber-Provo Canal and change in storage in Wanship Reservoir. 25/ Change in storage in Deer Creek Reservoir, minus diversions through Duchesne Tunnel and Weber-Provo Canal, plus diversion through Salt Lake City Aqueduct.

26/ Change of storage in Lake Tahoe and Boca Reservoir. (Forecast by Truckee Basin Committee) 27/ Change in storage in any of these reservoirs above the station: Kootenai Lake, Hungry Horse, Flathead Lake, Pend Oreille Lake, F. D. Roosevelt Lake, Lake Chelan, Coeur d'Alene Lake, Brownlee and Noxon; and pumpage at Roosevelt Lake. 28/ Changes in storage in Coeur d'Alene Lake and diversions by Spokane Valley Farms Company and Rathdrum Prairie canals. 29/ Change in storage in Lake Chelan. 30/ Changes in storage for Jackson Lake and Palisades Reservoir above stations. 30/

31/ Change in storage in Henry's Lake, Island Park and Grassy Lake reservoirs and diversions between Ashton and Rexburg. 32/ Change in storage in Mackay Reservoir, and diversion in Sharp Ditch. 33/ (Combined flow Big Wood River nr. Bellevue and Camas Creek nr. Blaine.) 34/ Change in storage in Arrowrock, Anderson Ranch, and Lucky Peak. 35/ Change in storage in Cascade and Deadwood reservoirs. 36/ Change in storage in Keechelus, Kachess, and Cle Elum reservoirs plus diversion by Kittitas Canal. 37/ (Corrected to natural flow). 38/ Change in storage in Merwin, Yale, and Swift reservoirs. 39/ (Corrected for upstream impairments).

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